

IES

Newsletter

Volume 1, Number 4
July-August, 1984

The IES Newsletter is published bimonthly by the Institute of Ecosystem Studies at the Mary Flagler Cary Arboretum. Located in Millbrook, New York, the Institute is a division of The New York Botanical Garden. All newsletter correspondence should be addressed to the Editor.

Gene E. Likens, Director
Joseph S. Warner, Administrator

Editor: Marc Breslav
Copy Editor: Julie Morgan
Photographer: Emil Keller
Design and Printing: Maar Graphics Group

The New York Botanical Garden
Institute of Ecosystem Studies
Mary Flagler Cary Arboretum
Box AB
Millbrook, N.Y. 12545
(914) 677-5343



Emil Keller

A small part of the Earth's immense circulatory system, the Wappingers Creek flows through the Arboretum and on to the Hudson.

Fantastic Voyage On The Wappingers

by Marc Breslav

Imagine, for a moment, that the Earth is one giant organism, a living, breathing entity in which we humans are perhaps mere bacteria. The Wappingers Creek, which flows through backyards and villages of our area and on to the Hudson, might thus be a small part of the Earth's immense circulatory system. Multitudes of rivulets and branches empty like capillaries into a major artery — the Hudson — and from there on to the ocean and the atmosphere. The blood that is the essential link of this whole system is water, a source of life.

The area of land from which water drains into the Wappingers Creek is its watershed. Every drop of rain which falls on this watershed ultimately ends up in the creek, or evaporates. Likewise, a quart of used oil spilled on a driveway in this watershed, in some small way may eventually enter the Wappingers Creek. Whatever enters any stream must leave it and is either transported away or processed by the stream or its associated life. Similarly, whatever enters a watershed, either as precipitation or from human activity, does not just go away.

One quart of used oil is not going to make a big impact on the Wappingers Creek watershed or the creek itself. But, what goes up, must come down, and nothing goes away unless something else makes it go away. All materials that enter the watershed are either held, transported or processed. While that quart of oil might be insignificant by itself, what are the effects of road salt, septic tanks or acid rain on the Wappingers Creek and its watershed? Does lawn and farm fertilizer affect trout fishing? How do changing patterns of land use change the character of the creek and of the Hudson?

How does a whole watershed work? Research on this kind of question is what is often known in science as an ecosystem approach, a look at the whole through coordinated study of its parts.

The Mary Flagler Cary Arboretum lies along both banks of a portion of the creek's East Branch. There, some of the scientists from the Institute of Ecosystem Studies study the Wappingers Creek.

Dr. David L. Strayer, Institute Aquatic Ecologist, makes novel use of the ordinary flower pot. Recently, he submerged several inverted clay pots in the creek, sealing them and weighting their bottom. Each pot was filled with a jello-like substance, called agar, which had been inoculated with either nitrogen or phosphorus, plant nutrients which are also found in lawn fertilizer.

Since the clay pots are porous, the nutrients can seep out into the creek water as it rushes by. With the help of Emily H. Stanley, a summer research assistant, Dr. Strayer studies how many algae grow on the outer surface of those pots filled with nitrogen as compared to those filled with phosphorus. He also compares growth between sites in the stream, examining if, for example, there is greater algal growth in upstream areas which are closer to the discharge of the sewage treatment plant in Millbrook.

There are several tangible benefits to this flower pot experiment. It should contribute to knowledge about the effects of treated sewage effluent and fertilizer runoff on streams. But also, by understanding better what influences the growth of

Continued on page 2



Emil Keller

Dr. David L. Strayer, Institute Aquatic Ecologist, makes novel use of a set of flower pots.

algae, Institute scientists can learn more about the animals, including fish, which depend directly or indirectly on algae as a food source. Such knowledge will help the Institute to develop management plans for wise use of the creek's resources.

Dr. Strayer also coordinates several summer research projects on the creek. In one, Richard D'Ermilio, a SUNY Purchase student doing research at the Institute, studies what happens to the phosphorus discharge from Millbrook's sewage treatment plant. Mr. D'Ermilio tests the phosphorus content of creek water at several sites downstream from the plant. He analyzes how far downstream this phosphorus travels before it is completely taken up by stream processes, and thus is no longer found in the water. Because phosphorus is present in sewage and fertilizer, this study should give further clues as to how streams respond to changing land use.

With this spring's torrent fresh in mind, area residents certainly will agree that floods are major events for streams. But, who would have considered that such floods wreak havoc among the tiny organisms which inhabit the stream bottom, grinding them to death or moving them far downstream? Dr. Jerzy Kolasa, a Sum-

mer Research Fellow visiting the Institute from Poland, set cartons of sterilized stream-bottom sediment into the creek, reproducing the condition of the creek bottom after a major flood. He studies how fast tiny animals return to the stream bottom in the wake of this theoretical flood.

In a related project, Texan Dr. Robert Short, another Summer Research Fellow at the Institute, puts jars variously containing sand, gravel or stones into the creek. Water circulates through the jar with the help of a pump similar to that in an aquarium. The gases given off by the growth of plant and animal life in the jar are retained within the glass. Dr. Short analyzes the changes in oxygen content, a measure of the productivity of the life within the jar. He hopes to determine if sand, gravel or mud is the area of the stream where bottom life is most prolific.

Dr. Strayer plans another study of the creek's interstitial life — the microscopic organisms which live in the spaces between soil particles — on the stream's bank and bottom. His study will examine interstitial animals at points where groundwater enters the creek. Almost no research has been done on these organisms in North America, yet they may be useful as an indicator of the kinds and amounts of contaminants in groundwater. The presence or absence of certain organisms may actually indicate whether contaminating chemicals are in the groundwater, leading to more inexpensive and rapid ways of identifying and analyzing toxic waste movement in our waters.

Research is also planned on the effects of acid rain on various aspects of the watershed. What effects do the acids and other chemicals in rain and snow have on the soils, the plant life and the fish of the Wappingers Creek watershed?

The Wappingers Creek provides recreation for area residents. It carries away our wastes, enhances the value of our real estate and irrigates our farms. Its banks and waters are home to an abundance of diverse wildlife and plants. Its power has, along with the movement of glaciers and other geologic processes, shaped our landscape, from times well before the presence of humans. And, it will flow on long after we are gone.

This is the cycle of water. Descending from the skies upon the watershed, it moves then to the Wappingers Creek or evaporates again to the atmosphere. The creek water rolls on to the Hudson, and from there to the ocean and skies. All are interconnected, like the circulatory system of our bodies.

In the book *Fantastic Voyage*, scientists were shrunk and injected into a person's blood so that they could heal him. Researchers at the Institute of Ecosystem Studies, in their own version of this voyage, are studying one tiny part of the giant circulatory system of Earth, the Wappingers Creek.

Summer Researchers Flourish

by Julie C. Morgan

Editor's Note: Four of the large cast of researchers associated with the Institute this summer spoke to Julie Morgan about their experience here. The four are among those studying plant/insect interactions at the Institute.

Dr. Alcinda Lewis, a graduate of the University of Texas in Austin, is one of the three Summer Research Fellows at the Institute (see article on the Wappingers Creek for profiles of Dr. Jerzy Kolasa and Dr. Robert Short.) She and her three volunteer assistants from Pace University are examining whether butterflies, whose ecology and social structure are very different from that of bees, exhibit a similar ability to recognize specific flowers as sources of nectar. Dr. Lewis notes that the congenial working environment at the Institute and the great variety of habitats on the Arboretum property are key aspects to her success in this summer's work.

James S. Coleman, a graduate student in the Department of Forestry and Environmental Studies at Yale is conducting doctoral research at the Institute this summer, in collaboration with Dr. Clive Jones, Institute Chemical Ecologist. He is investigating whether or not the resistance of cottonwood trees to a rust and a leaf beetle is changed by a pollutant, ozone, and whether this resistance is related to the defensive chemistry of the trees.

John L. LeGuyader and Steven J. Compton are roommates in the new Bacon Flats Lodge and undergraduate research fellows working with Dr. Jones. Their funding is provided by the Research Corporation. This is Mr. LeGuyader's second summer in residence; he was awarded an undergraduate research fellowship in 1983 to examine the distribution and abundance of the insect community associated with sweet fern. Next autumn he will begin graduate studies in the Department of Ecology and Evolution at SUNY/Stony Brook, and he believes that this summer's experience, besides building up his background in entomology and statistics, will help him choose an area for future specialization in ecology.

A resident of Anchorage, Alaska, Mr. Compton just graduated from Dartmouth College with a major in chemistry. Through his thesis work on Caribbean sea sponges he became interested in ecology, and this summer is developing a method for chemical analyses of plant proteins available to insects. He hopes this new method will be useful in many areas of ecology. Mr. Compton finds the Institute a relaxed and friendly place and says he certainly prefers his lab work to last summer's employment — scraping the slime off salmon in Alaska!

Vegetation Analysis Underway

by Marc Breslav

Researchers at the Institute, in an attempt to learn more about their own "backyard," have begun an analysis of vegetation of the Arboretum.

Preliminary findings show an unusually high mortality rate among two tree species. Most of the flowering dogwoods encountered throughout the property are dead or have many dead branches. Extensive mortality among hemlocks has also been observed.

The study, which scientists call a vegetation analysis, seeks to systematically measure and analyze the types and abundance of the plants and their habitats throughout the entire Arboretum. This process is a basic starting point for the kind of long-term ecological research planned on Arboretum grounds.

The project is a natural outgrowth of the research interests of Dr. Charles D. Canham, Plant Ecologist, and Dr. Mark J. McDonnell, Terrestrial Ecologist at the Institute. The two designed and coordinate the study, with field support from summer research assistants Daniel M. Spada, from the New York State College of Environmental Sciences and Forestry at Syracuse, and Carolyn J. Wilczynski, from Rutgers University.

Using an existing grid system that divides the Arboretum into more than 950 blocks, the researchers are initially concentrating on forest habitats. They randomly select one out of every three grids that are entirely composed of forest, and move in to the chosen one with an array of tape measures, compasses and other equipment. A circular plot is set up within the grid, and Mr.



Emil Keller

Daniel M. Spada, a summer research assistant, measures a plot as part of the vegetation analysis of the Arboretum.

Spada and Ms. Wilczynski then go about the business of identifying, counting and measuring the vegetation.

Mr. Spada and Ms. Wilczynski also note various topographic aspects of the plot, and take four soil samples. They observe conditions that may give clues to the history and past human uses of the area, such as the presence of burned stumps or stone walls. Finally, they remove a small core from the largest tree in the plot. Thus, without cutting down or damaging that tree, they are essentially allowing it to "tell" its life story. The cores will be aged by Drs.

Canham and McDonnell back in the laboratory, in much the same way as they might age a stump by analyzing its tree rings.

The researchers will move on from analyzing forests on the Arboretum, and begin to sample its wetlands and fields. In addition to its benefit as the starting point for long-term ecological research on the Arboretum, the analysis will give clues about how past land use and environmental conditions have influenced the vegetation of the Millbrook area.

Weather Station Installed

by Marc Breslav

A full-scale weather station has been installed at the research field within the Arboretum.

While the Institute's weather station does not report directly to any weather data monitoring network, its data will be useful as a baseline for long-term ecological research and educational programs planned at the Arboretum, and as a reference for current studies. The information collected will also be used for horticulture purposes, and by the local media.

Most of the equipment is attached to a 32-foot tower in one corner of the field. Wind speed and directional sensors cap the structure, along with a lightning rod. About midway down the tower are instru-

ments which record the air temperature and relative humidity. Toward the base is a device known as a tipping bucket rain gauge which records the amount of rain. During the winter months the device is heated so that snow is melted and measured in liquid form.

Solar radiation is measured in several different ways by devices near the bottom of the tower. Research on the effects of light intensity and quality on plant growth is one of the many studies which make use of solar radiation data.

A recording computer, also located at the base of the tower, scans each weather sensor every 10 seconds and, after performing certain calculations, transfers the

information to a standard cassette tape. The tape is brought to the Institute laboratory once a week to be read into a computer and stored for later use.

For some time the Institute has been collecting precipitation using equipment that is not part of the weather tower. The material collected then undergoes laboratory analysis for acidity and the presence of about a dozen chemicals, such as sulfur, nitrogen and aluminum. These analyses are useful in studies of acid rain and its effects on natural ecosystems. For example, the average pH of precipitation falling on the Arboretum over the first half of the year was 4.03, which is more than ten times more acid than unpolluted precipitation.

Inside the Institute

by John Bakke

PEARL GOES TO GREAT BRITAIN

Alexander M. Pearl, Institute Nursery Foreman, is attending "Liverpool '84," the annual International Garden Festival that this year takes its name from the British city. The exposition, held in a different city each year, represents more than 30 countries, and covers nearly 200 acres. His three-week trip in August is being made possible by a grant from Vassar College, where Mr. Pearl teaches a course in horticulture. The annual grant, drawn from the Andrew W. Mellon Fund for Faculty Renewal, is given to a Vassar faculty member to help improve his or her instructional abilities.

WARNER RECEIVES AWARD

Joseph S. Warner, Institute Administrator, recently received a special commendation from the Bethany, Ct. Conservation Commission. Before taking his post at the Institute, Mr. Warner lived in Bethany and served on the commission from 1974 to 1980. The award recognized his work during that period toward the preservation of Bethany's open space and natural resources.

BIRD SEED

Arboretum Members will be receiving forms for ordering bird seed in the mail. Others may obtain forms by calling the Gift Shop at (914) 677-5358. The last day for ordering the seed will be Oct. 2, 1984, and orders may be picked up on Oct. 13, also known as Bird Seed Savings Day. The Gift Shop also needs volunteers. Those interested should call Peggy Taft at the above number.

The New York Botanical Garden Institute of Ecosystem Studies

Mary Flagler Cary Arboretum
Box AB, Millbrook, New York 12545

Autumn Calendar

Sunday Programs

Programs begin at 2 p.m. All programs meet at the Gifford House unless otherwise noted. Members are admitted free of charge; admission for others is \$1 for adults and 50¢ for children under 13.

- Oct. 7 **Interpreting the History of New England Woodlots**
- Oct. 14 **Ecology of A Woodland Stream**
- Oct. 21 **Greenhouse Tour**
Meet at Greenhouse.
- Nov. 4 **Tour of the Institute Laboratories**
Meet at Plant Science Building.
- Nov. 11 **All About the White-tailed Deer**
- Nov. 18 **Liverpool '84**

Courses

Course dates, lengths and fees vary. Some are part of longer certificate programs. Descriptions and registration information are highlighted in the Fall Brochure. Members will receive this by mail; non-members should call to request a copy.

Identification of Higher Fungi

Fundamentals of Gardening
Pruning Trees and Shrubs
Wildflower Cultivation
American Indian Traditions in Herbalism

Horticulture as a Tool for Therapy

Landscape Design Theory
Landscape Design I: Analysis and Schematic Design
Graphics

Dried Flower Workshop
Turkey Hunting and Calling in the Fall
Sketching for Landscape Design
One Day Herb Workshop

Large Wired Pinecone Wreath
Stenciled Stationery
Corn Husk Wreath
All Season Wreath and Candlestick Greenery
Evergreen Wreath
Centerpiece

Scientific Seminars

The Institute's weekly program of scientific seminars resumes on Sept. 7. The seminars feature presentations by visiting scientists or Institute staff, and take place at the Plant Science Building on Fridays at 3:30 p.m. Admission is free. For a schedule, contact Julie Morgan at (914) 677-5343.

Arboretum Hours

Mon. through Sat., 9 a.m. to 4 p.m.;
Sun., 1 p.m. to 4 p.m. Closed on
Labor Day, Columbus Day, Election
Day and Thanksgiving Day. All
visitors, including Members, must
obtain a free permit at the Gifford
House for access to the Arboretum.

For more information, call (914) 677-5359.

Nonprofit Org.
U.S. Postage
PAID
Millbrook, N.Y.
Permit No. 16



100% Recycled
Paper